INVESTIGATION AND CLOSURE OF UNDERGROUND STORAGE TANKS

BURBANK-GLENDALE-PASADENA AIRPORT

BURBANK, CALIFORNIA

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The undersigned have reviewed this report and the data on which it is based. Professional judgment represented herein is predicated on the evaluation of the analytical results, the data gathered during the field investigation, information available from previous studies, as well as general experience in hazardous waste investigations.

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1.0 ABSTRACT

The Burbank-Glendale-Pasadena Airport Authority instructed A. L. Burke Engineers to begin an investigation of underground tanks located on its property in October 1986. This investigation constituted the first phase of the Authority's underground tank management program. All tanks, active or abandoned, Authority or Tenant-owned, were included in this work. In addition, the potential for contamination from crash and rescue operations at the firepit area was also evaluated.

Records research, personal interviews, visual inspection, and remote sensing methods (magnetometry and electromagnetic induction) were used to determine the location of tanks. Soil sampling and analysis was conducted at the firepit and eight sites; this investigation included soil sampling from the area near a total of 18 tanks. One sump sample was collected and analyzed.

Laboratory analyses indicated minimal levels of contamination at two sites -- the firepit and near the Authority's abandoned tanks in the current Hertz Equipment Rental lease; no contamination was detected at the other sites. Recommendations for regulatory compliance were developed for each tenant and for the Authority. Plans and specifications for removal of abandoned tanks were prepared, and the contract was let to Academy Geotechnical Engineering of Lake Elsinore, California.

At closure, six tanks were removed, one was abandoned in place, and another suspected tank was found to have nothing more than the fill pipe remaining. Soil samples were taken for analysis under each tank and suspected tank. The laboratory results showed minimal levels of contamination, and the areas were backfilled, compacted to greater than 95% and repaved.

2.0 INTRODUCTION

This report presents the investigation and closure of underground tanks at the Burbank-Glendale-Pasadena Airport (hereafter referred to as the Burbank Airport), Burbank, California. This section summarizes background information including concerns regarding underground tanks, the objectives of the study, and site descriptions of the area within the study.

2.1 Background

Subtitle I of the Hazardous and Solid Waste Amendments of 1984 authorized the U.S. Environmental Protection Agency (EPA) to establish a program regulating underground storage tanks. The statute required owners to notify their State of the existence of underground tanks, prohibited the installation of new unprotected tanks, and delegated responsibility to the EPA for the promulgation of corrective action standards. In response to these new regulations, the State of California adopted regulations regarding the storage of petroleum products and other hazardous substances in underground tanks. The counties are the primary government entity responsible for enforcing these regulations. One small area of the Burbank Airport lies within the City of Los Angeles; the city has passed a separate ordinance and therefore, they have jurisdiction in this area. The main intent of the legislation was to protect ground water, specifically aquifers used for drinking water purposes, from contamination. Consequently, many businesses are required to examine their underground storage tanks for leakage. The Burbank Airport Authority requested A. L. Burke Engineers, Inc. to survey the entire airport area, including leaseholds, for underground storage tanks and to prepare plans and supervise the closure of the abandoned tanks.

2.1.1 Summary of the Investigation

A records search and field investigation was completed in October, November, and December, 1986. Records, former correspondence relating to real estate property transfers, and drawings were reviewed. The investigation included interviews with the tenants and airport personnel familiar with past practices relating to underground storage of fuels and waste materials. The field investigation consisted of site reconnaissance and coordination, identification and location of both abandoned and active underground tanks, field geophysical work, collection of subsurface soil samples, and chemical analysis of the samples. Interpretation of the data, preparation of the first phase report and closure plans were completed, and closure of the abandoned tanks was then carried out.

2.1.2 Objectives of Investigation

The Burbank Airport Authority decided to take an inventory of all active and abandoned tanks and to investigate the soils and any ground water encountered near abandoned tanks. The main objective is to come into compliance with applicable regulations and to remove any potential hazard to the community from the underground storage tanks. The tasks were:

1. to identify all active tanks;

2. to determine their locations; and

3. to tabulate the above information and represent it graphically.

The abandoned tanks were subjected to a geotechnical investigation for leakage. Specific objectives for these structures were:

1. to identify all abandoned underground tanks;

2. to pinpoint the location of the tanks;

3. to determine their dimensions and the nature of their contents;

4. to evaluate the evidence for leakage of the contents and their spread in the environment;

5. to formulate closure plans for abandoned tanks; and

6. to supervise closure of the abandoned tanks.

2.2 Site Descriptions

Burbank-Glendale-Pasadena Airport is located in southern California within the city limits of Burbank (Figure 1). The airport is bounded by San Fernando Road to the north, Hollywood Way to the east, Van Owen Street to the south, and Vineland and Clybourne Avenues to the west. The airport lies within a transition from commercial and industrial land to the east to residential land to the west. The land was originally owned by Lockheed Air Terminal and leased to the Burbank Airport Authority; however, the Burbank Airport Authority purchased the property in 1978. A fire pit is located to the north of the north-south runway; it periodically is used for fire fighting (crash and rescue) practice.

2.3 Tenant Leaseholds

Some of the land around the perimeter of the Burbank Airport is leased to various tenants. These tenants use the land for car rentals, airplane maintenance, aircraft fuel, and small aircraft rental. Figure 2 shows the tenants and their location as of the date of this survey. Underground storage tanks on their property were also part of this investigation.

3.0 SCOPE OF SERVICES

This investigation included an inventory of the underground tanks at the Burbank Airport (both those used by the Authority and by the tenants) and a geotechnical investigation of the abandoned tanks. The soil around and under the abandoned tanks was sampled and tested to determine the extent of any leaks, and the presence, quantity, and type of contaminants. Closure plans were formulated, and the tanks closed.

The primary objective was to remove any potential hazard to the community from underground storage tanks and to come in compliance with applicable regulations.

The Airport Authority desired a comprehensive study of all known and unknown underground storage tanks and an evaluation of the airport's practice fire pit on its property. General tasks within the scope of work include:

PHASE I SURVEY

I. Review all pertinent documents, leases, easements, aerial photographs, and appraisals with airport staff members. Also research the records of appropriate city agencies.

II. Inspect the airport property and confirm the location of the tanks suggested in documents reviewed and search for potential tanks not identified in documents.

III. Prepare an inventory listing tanks and depict the location of the tanks on an airport furnished layout plan.

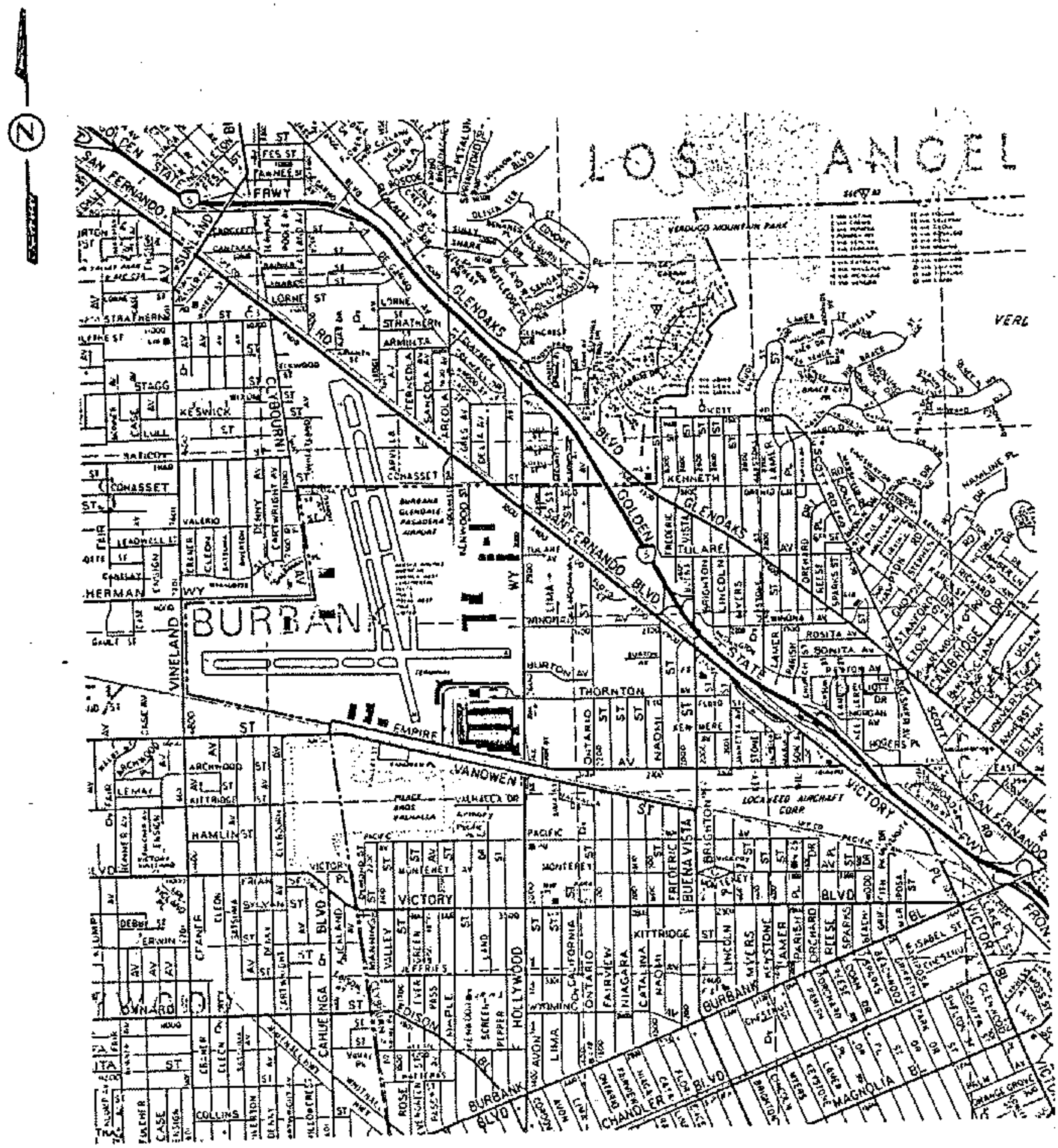
IV. Do an appropriate inspection on each tank to yield as much data as reasonably possible about the tank.

A. Abandoned Tank
   1. Screen contents;
   2. Perform soil boring to determine if contamination present; and
   3. Determine size and other data on tank.

B. Operational Tank
   1. Review user documentation;
   2. Inspect site; and
   3. Report status.

C. Fire Pit
   1. Inspect site; and
   2. Perform soil borings to determine if contamination present.

V. Prepare recommendations for the Authority for the removal of storage tanks.



A. L. BURKE ENGINEERS, INC. 1183 NORTH KRAEMER PLACE ANAHEIM, CALIFORNIA 92806	DRAWN G.H.M. DATE 3/23/86 APPR. ALBE	CHECKED DATE APPR. CLIENT	GENERAL LOCATION MAP
	SCALE NONE	CLIENT DWG. NO.	ALBE DWG. NO. / REV. NO.

BGPAA 0677

VI. Prepare recommendations for actions which the tenants needed to take to comply with appropriate regulations.

The site reconnaissance included a review of the available plans and drawings, as well as interviews with operating personnel for the various activities. An inventory was compiled and areas where abandoned tanks were still thought to be underground, were listed. The individual areas of abandoned tanks were examined visually and with geophysical instruments such as a magnetometer and electromagnetic induction. At the sites where abandoned underground storage tanks were thought to be located, potential places for borings were selected.

The field exploration phase consisted of logging borings and collecting soil samples for analysis. The borings were drilled with a hollow stem auger drill rig. A geologist observed the soils encountered in each boring and compiled a detailed subsurface log, including:

1) soil units encountered;
2) depth obtained and condition of samples collected;
3) evidence of contamination, if observed; and
4) depth to ground water, if encountered.

A technician collected and prepared samples for transport to the laboratory. This procedure included:

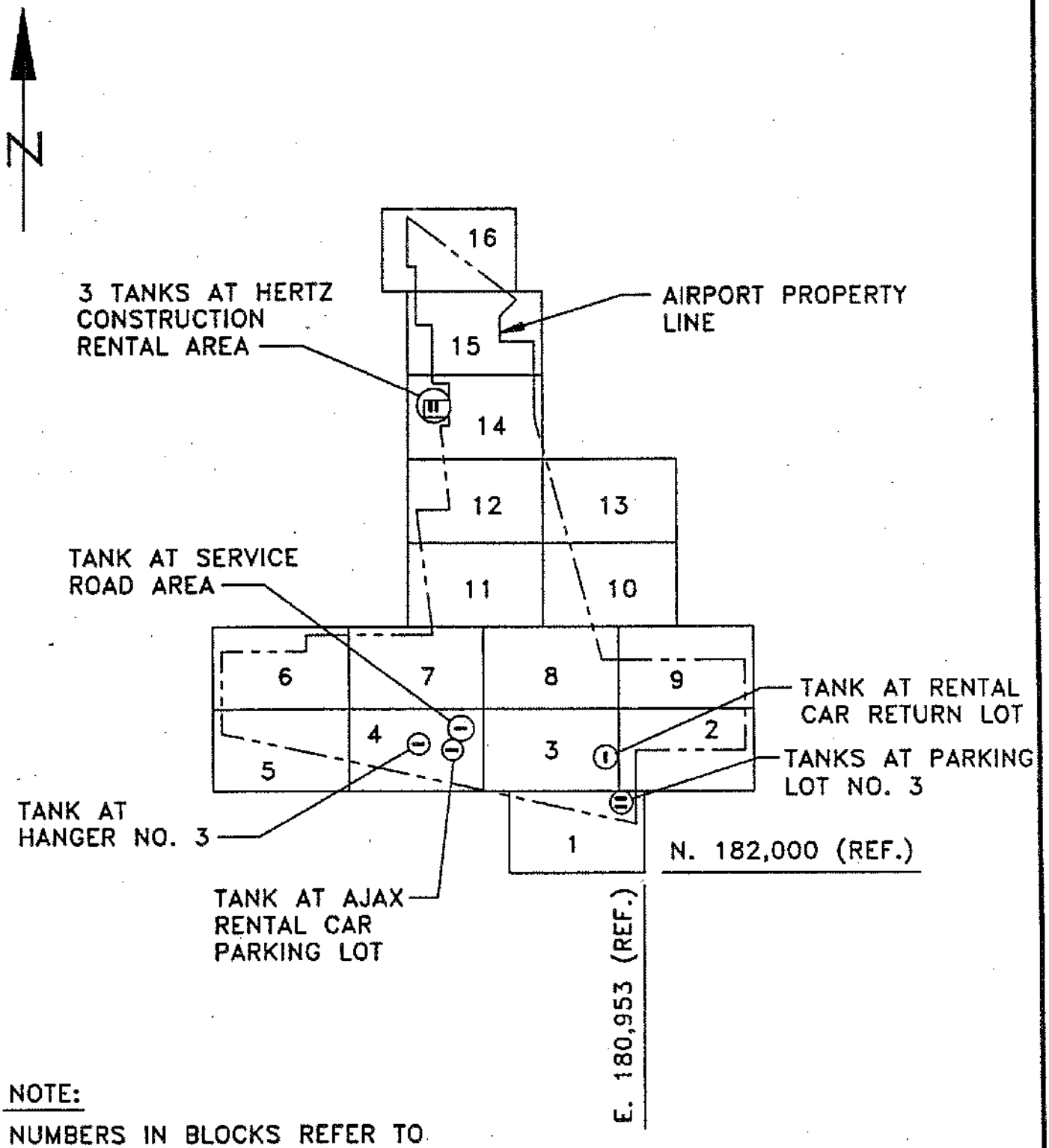
1) trimming each soil sample and capping it with aluminum foil, and plastic protective caps;
2) labeling each sample, entering the data onto a field log, and preparing chain of custody documentation; and
3) storing the samples in portable ice chests to reduce the potential for volatilization.

The soil samples were taken to the laboratory at the end of each day. A laboratory representative signed for the samples and placed them into cold storage until analysis.

The Phase I report included a description of the field work and laboratory testing procedures together with general findings on the geologic and hydrogeologic conditions, laboratory test results, toxicity data, and applicable government regulations. Design parameters for excavations and information on closure plans were also discussed. Airport layout plans with the location of each underground storage tank were given to the Airport Engineer.

PHASE II CLOSURE

I. Preconstruction Meeting to discuss sequence of work, schedule, storage areas, temporary use of utilities, project coordination, airport procedure, security, safety, airport operations, and housekeeping, particularly the need for dust control to prevent a nuisance and also to prevent possible spread of contamination by dust born particles.



NOTE:

NUMBERS IN BLOCKS REFER TO MASTER UTILITY PLAN DWGS.

A. L. BURKE ENGINEERS, INC. 1183 NORTH KRAEMER PLACE ANAHEIM, CALIFORNIA 92806	DRAWN G.H.M. DATE 5/25/88	CHECKED DATE	KEY PLAN (FOR UNDERGROUND TANK LOCATIONS)
	APPR. ALBE	APPR. CLIENT	
	SCALE NONE	CLIENT DWG. NO.	ALBE DWG. NO. / REV. NO.

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II. Location and marking of the tanks to be removed. These were checked using magnetometry.

III. Exposure of tanks, removal of any contents in barrels and disposal at the appropriate site. Inerting tanks using carbon dioxide.

IV. Checking of tanks for any residual hydrocarbons, remove tanks, take soil samples from one foot under each tank.

V. Checking for any leakage with laboratory analysis of soil samples, remedial action if necessary, backfill, compact to 95% minimum, repair pavement.

TABLE 3-1

LOCATION OF TANKS TO BE CLOSED

Hertz Equipment Rental Yard	3	tanks
Ajax Rental Car Parking Lot	1	tank
Service Road Area near Runway	1	tank
Rental Car Return Lot	1	tank
Parking Lot 3	1	tank

An abandoned tank was found close to Hangar 3. As no contamination was detected at this site and because of possible damage to the Hangar foundation, this tank is being abandoned in place. A copy of the letter concerning this tank is found in Appendix C.

4.0 PROCEDURES

4.1 Phase I Field Investigation

The field investigation of Phase I consisted of interviews of tenants and airport personnel, a geophysical survey near suspected abandoned tanks, a health and safety program for the drilling operations, air and soil sampling near the selected sites, and one sump sample collection. A daily field log was kept which detailed onsite activities.

4.1.1 Interviews

A. L. Burke Engineers, Inc. interviewed the various tenants and airport personnel (fire and maintenance departments) to determine the locations of tanks in use or abandoned. Based on the results of the interviews, visual inspections of the Airport property, aerial photographs, real estate records, written correspondence, and from input by the Airport manager and engineer, the approximate number and locations of abandoned underground storage tanks were determined. These tanks were then investigated using geophysical techniques.

4.1.2 Geophysical Survey

McClelland Engineers, Inc. performed a geophysical survey using an electromagnetic Geonics EM31 unit in late November. They surveyed nine areas to try to pinpoint the locations of abandoned underground storage tanks.

4.1.3 Health and Safety Program

The major elements of the Health and Safety Program were the following:

* medical monitoring to establish baseline data and to track possible exposure to any compounds encountered during the field work.

* occupational health and safety plan to define procedures for the use of protective equipment; field operations; on-line monitoring requirements; and personnel safety training.

* respiratory protection plan to detail the use and care of respiratory protection equipment.

* coordination procedures for interface with local public facilities.

4.1.3.1 Medical Monitoring - All of A. L. Burke Engineers personnel, whose work includes field operations at underground tank investigations, are required to take a pre-job physical.

Essentially, the preliminary medical test results indicated that all A. L. Burke Engineers, Inc. personnel were in good health; no test results indicated significant previous exposures. At the conclusion of major projects, all personnel undergo a final physical examination.

4.1.3.2 Health and Safety Plan - The occupational health and safety plan, as updated for this field work, was presented in its entirety in Appendix B of the final report of the Phase I investigation.

4.1.3.3 Coordination Procedures - Coordination procedures for the use of medical facilities were defined in the health and safety plan.

4.1.4 Air Monitoring Program

As part of the safety program as well as the gas monitoring air pollution program, a Bacharach Model TLV "Sniffer" was used at each drill site to measure the organic vapors from the boring.

4.1.5 Soil Sampling Procedures

4.1.5.1 Selection Process for Boring and Sample Locations - To evaluate the environmental impact of abandoned underground storage tanks at Burbank Airport, a detailed set of data must be compiled on the soil conditions in the vicinity of the tanks. In order to optimize the number and location of the borings and maximize the field exploration data, several factors were evaluated prior to selection of each soil boring location. These factors included:

1. location and orientation of abandoned underground tanks and adjacent subsurface and surface structures;
2. tank size;
3. physical and chemical properties of material(s) stored during the tank service period;
4. regional soil and geologic conditions; and
5. regional ground water conditions.

The borings were located based on regional ground water gradient, anticipated dispersivity of the stored materials, and local subsurface and surface structure constraints.

Prior to the drilling of each boring, a site utilities map was inspected to locate any underground obstructions such as electric lines, telephone lines, or piping. When drilling operations were close to buildings, the first two feet of soil was dug by hand as an added precaution against interrupting utility service.

During the field exploration, each boring was continuously monitored for the presence of combustible vapors using a Bacharach Instruments TLV meter. The vapor monitoring was used to evaluate, on a real time basis, the possible presence of soil contamination and make appropriate modifications to the boring locations in order to determine the extent of contamination.

During the closure of the tanks, soil samples were taken using a backhoe to remove soil from under the tanks. Preparation of the samples were the same as for the first phase of the investigation.

4.1.5.2 Drilling and Sampling Procedures - A Mobile B-61 hollow stem flight auger drill rig was used to drill the borings in this project.

The hollow flight augers allow the insertion of soil samplers which pass through the lead auger and into the undisturbed soil beneath the cutting bit.

The soil sampler was a 3 inch O.D. split-barrel attached to a waste barrel containing a ball check valve. Six inch long brass tubes were placed inside the sampler and following sampling, the tube nearest the driving shoe was trimmed and capped for shipment to the laboratory.

4.1.5.3 Soil Sample Preparation - After a soil sample was selected for laboratory testing, each end of the brass tube was covered with aluminum foil and a plastic tight-fitting cap. The sample was placed in a Zip-Loc plastic bag and a label affixed to the tube and/or the plastic bag. Samples were then placed in a styrofoam chest with frozen Blue Ice and delivered to the laboratory each afternoon. Chain-of-Custody forms were filled out for each shipment.

4.1.6 Sump Sampling Procedures

At abandoned tanks where liquids remained in the tank and where the fill pipes were able to be opened, a sump sample was taken with a bailer, poured into a glass vial, and sent to the laboratory for analysis. One sump sample was collected during this project; it was obtained from the southern most abandoned tank located in the Hertz Equipment Rental yard (lease area 3).

4.2 Phase II Tank Closure

4.2.1 Pre-Construction Meeting

The Pre-Construction Meeting for the Underground Tank Removal, Bid Schedule 87-7 was held in Conference Room 3, Building 9 of the Burbank-Glendale-Pasadena Airport on March 7, 1988 at 10:00 a.m. Representatives from the Airport Authority, Academy Geotechnical Engineering and A. L. Burke Engineering were in attendance. The Agenda included a summary of the project, the sequence of work with locations of the tanks to be confirmed

using magnetometry, and scheduled start on March 21. The contract area, storage requirements, temporary use of facilities such as water and electricity and communications were discussed. Key personnel were designated from each group. Airport procedures were discussed, including security, fire regulations, safety and first aid, the necessity for dust control and safe movement and use of crane operations, especially near the runway.

The removal of the tanks was to be performed by Academy Geotechnical Engineering of Lake Elsinore, California.

4.2.2 Location of Tanks

On April 4, 1988 the locations of the tanks were confirmed using the magnetometer, and marked using paint on the pavement except for one location where there was no pavement, but the location of the tank was clearly marked by a fill pipe. The marking was done by Academy Geotechnical Engineering with a representative from A. L. Burke Engineers concurring with the findings.

4.2.3 Removal of Tanks

On April 7, Academy Geotechnical Engineering exposed the tanks and cut holes in the tops. The soil from each excavation was piled around the excavation, and cordoned off with yellow cones and tape labeled "Caution. Do not enter". Academy informed A. L. Burke representatives that they had treated the tanks with carbon dioxide (dry ice) on April 7 and again on the morning of April 8 when the tanks were removed from the ground.

On April 8, Academy moved their crane onto the site, together with trucks which would remove the tanks. The first site to have the tanks removed was at the Hertz Equipment Rental Yard where three tanks were removed. The method of removing the tanks was the same for all locations. First, a sniffer was used to confirm that there were no volatile hydrocarbons remaining in the tanks, cables were attached to the tank at two points for lifting, and lighter lines for controlling the movement of the tanks. The crane lifted each tank with two men holding the lines and directing its movement onto the flatbed of the truck. When in place, strong cables were placed around the tank attaching it to the truck. The largest tank was lifted first, then the next with the smallest tank being lifted last. At all other sites there was only one tank to be removed. When the tanks had been removed, the crane and trucks moved to the next site for the next tank removal.

Tanks were then removed from beside the service road beside the runway, at the Ajax Rental Car lot, and the Rental Car Return lot. Airport security personnel accompanied all personnel at the site beside the runway. Security, Burbank fire chief and Airport Authority personnel were present at the Ajax Rental Car lot to observe progress of the removal.

4.2.4 Soil Sampling Under Tanks

Sampling was done using a backhoe. The backhoe first removed any soil which had caved into the excavation, then removed several scoops of soil from underneath the tank's position until an undisturbed sample could be lifted by the backhoe. Samples were then taken in laboratory bottles, sealed, labeled and placed in a cooler for shipment to the laboratory. Two samples were taken from underneath each tank - one to be tested and the other to be archived for possible future use. A Chain-of-Custody form was filled out for the samples.

All information indicated that there was a tank buried at the end of Parking Lot 3. The location was marked, but when Academy dug to uncover the tank; nothing could be found. They excavated to a depth of 16 feet, then backfilled the hole. On April 8 a backhoe was used to trench the area and soil samples were taken from undisturbed soil where the tank had been according to records.

4.2.5 Backfilling and Repairing Pavement

After the samples had been taken, the holes were backfilled to prevent accidents. The samples were taken to the laboratory for testing. Results were available verbally on Tuesday, April 12, showing minimal amounts of volatile hydrocarbons, and Academy was informed that they could continue with the compaction and repaving of the disturbed areas.

While excavating at the Hertz Equipment Rental Yard, a water line was broken. This line was closed off by Academy, and later repaired by the Airport Authority.

Academy checked the compaction, which was also checked independently by a representative of the Airport Authority and was found to be greater than 95%. The Airport Authority reported that the asphalt repairing of the pavement disturbed by the excavation was acceptable.

4.3 Laboratory Testing

4.3.1 Chemical Screening Program

Soil samples, taken near tanks which contained gasoline products in the past, were analyzed for petroleum hydrocarbons by means of the fuel footprint test -- a modified form of EPA test 8015 during the first phase of the project. Samples taken from under the tanks during closure were analyzed using EPA 418.1 for total hydrocarbon content.

4.3.2 Test Procedures

The test methods that were used to run the analyses were according to Test Methods for Evaluating Solid Waste (EPA, 1982). Table 4-1 describes the test methods according to EPA numbers and the chemical compounds detected by each test method. Chemical Research Laboratories, Inc. in Stanton, CA performed the analytical work; this laboratory is certified by the California Department of Health Services to perform hazardous waste

analysis. The laboratory performed their own internal Quality Assurance/Quality Control (QA/QC) program consisting of duplicates, blanks, and spiked samples according to federal and state standard laboratory practices.

TABLE 4-1. TEST METHODOLOGY AND PARAMETERS ANALYZED

The following laboratory methods analyze samples for the chemical parameters listed:

1. VOLATILE ORGANICS ANALYSIS (VOA) (EPA 8240)
(This method is based upon a purge-and-trap, gas chromatographic/mass spectrometric (GC/MS) procedure. It is used to determine volatile organic compounds in a variety of solid waste matrices.)

Chloromethane
Bromomethane
Vinyl chloride
Chloroethane
Methylene chloride
Trichlorofluoromethane
1,1-Dichloroethene
1,1-Dichloroethane
trans-1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
1,1,1-Trichloroethane
Carbon tetrachloride
Bromodichloromethane
1,2-Dichloropropane
trans-1,3-Dichloropropene
Trichloroethene (Trichloroethylene or TCE)
Benzene
Dibromochloromethane
1,1,2-Trichloroethane
cis-1,3-Dichloropropene
2-Chloroethylvinyl ether
Bromoform
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
Chlorobenzene
Ethyl benzene
Acetone
Carbon disulfide
2-Butanone
Vinyl acetate
2-Hexanone
4-Methyl-2-pentanone
Styrene
Total xylenes

TABLE 4-1. TEST METHODOLOGY AND PARAMETERS ANALYZED (CONTINUED)

2. FUEL FOOTPRINT (EPA 8015 Modified)
(A soil extraction is performed first, followed by the insertion of the extract into a gas chromatograph (GC) using a flame ionization detector (FID). Hydrocarbon standards are run on the GC and a fingerprint of the hydrocarbons (jet fuel, lube oil, or gasolines) is obtained.)

Total Petroleum Hydrocarbons (Aliphatics and Aromatics)

3. ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)
(A soil extraction is performed first, using either the Soxhlet extraction (Method 3540) or sonication (Method 3550) procedures. The extract is injected into a gas chromatograph (GC) using the solvent-flush technique, and compounds are detected by an electron capture detector (ECD).)

PCB'S including quantification of:

Aroclor	1016
Aroclor	1221
Aroclor	1232
Aroclor	1242
Aroclor	1248
Aroclor	1254
Aroclor	1260

4. TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (EPA 418.1)
(The sample is acidified to a low pH (<2) and serially extracted with fluorocarbon-113 in a separatory funnel. Interferences are removed with silica gel adsorbent. Infrared analysis of the extract is performed by direct comparison with standards.)

Total Petroleum Hydrocarbons (Light fuels, gasoline, diesel fuel)

5.0 FINDINGS

5.1 Results of Investigation

The following sections summarize the results of document reviews, interviews with tenants and Airport Authority personnel, visual reconnaissance and soil testing.

5.1.1 Abandoned Tanks

Soil borings were drilled near all of the abandoned tanks discovered during

the investigation. Closure plans were prepared and these tanks have now been closed.

5.1.2 In-Use Tanks

Tanks currently in use by the Authority or tenants require leak detection and tank monitoring programs to be implemented for each of these tanks in order to obtain an underground storage permit and comply with current regulations.

5.1.3 Firepit (Crash and Rescue Operations)

The investigation of the firepit area was expanded because of the nature and levels of contamination found at two other major southern California Airports. At those sites, PCB's and a range of volatile organic compounds were detected. Based on the results of the investigation, no curtailment of operations or remedial structures were recommended. The Airport Authority may want to consider paving the site to contain any liquids and prevent migration of the liquids into the ground. It was recommended that an ongoing record of operations at this site be maintained. This document should include the date of any burns; the quantity, type and source of combustible material used; and any unusual conditions or results noted. It is also recommended that liquids of unknown origin not be used for practice operations to avoid introducing potentially toxic substances (transformer oils, mixed solvents, etc.) into the area.

5.2 Geologic Conditions

5.2.1 Regional Setting and Topography

The Burbank Airport is located on the eastern side of the San Fernando Valley Basin. This Basin is bounded on the east and northeast by the Verdugo and San Gabriel Mountains. The north side of the Basin consists of the San Gabriel Mountains and the eroded south limb of the Little Tujunga Syncline. This syncline separates the San Fernando Basin from the Sylmar Basin. The northwest and west parts of the San Fernando Basin are surrounded by the Santa Susana Mountains and the Simi Hills; the Santa Monica Mountains rim the southern portion of the Basin.

Burbank Airport lies on a flat alluvial plain of the San Fernando Valley; it is outside the 100 year floodplain. Elevations range from 680 feet above sea level on the southeast part of the Burbank Airport to 790 feet above sea level on the northwest. This represents a change in relief from the northwest to southeast of 110 feet. (PRC Engineering, 1984)

5.2.2 Soils and Lithology

The geologic units underlying Burbank Airport are a complex section of Cenozoic and Upper Mesozoic sedimentary rocks overlain by Quaternary alluvial deposits. Soils consist of Tujunga (60%), Soboba (30%), and sand and cobbly material (10%). The Tujunga-Soboba soil association can occur

to depths of 5 feet and is characterized by high permeability. (PRC Engineering, 1984)

In general, the eastern portion of the San Fernando Basin contains alluvial deposits of coarse materials, such as sands and gravels, interbedded with localized lenses of clays and silts. (Los Angeles City, 1986) Soils encountered during the field investigation were mostly coarse sands with occasional gravels and pebbles. The deepest soil borings continued to 40 feet; ground water was not encountered. The sands were very loose with little cohesion. Due to the grain size and lack of cohesion, any product which may have leaked from underground storage tanks in the past, would have migrated through these soils rapidly.

5.2.3 Faulting

The closest known seismic fault, the Verdugo, lies one mile southwest of the Burbank Airport. The fault is potentially active and has a Maximum Credible Earthquake rating of 6.8 (Richter Scale). Other major faults in the area include: the San Gabriel Fault zone (nine miles away), the Inglewood Fault zone (nine miles away), and the San Andreas Fault zone (28 miles away). Minor fault complexes exist at the eastern terminus of the Santa Monica Mountains (five miles away) and in the San Rafael hills (eight miles away). (PRC Engineering, 1984)

5.3 Hydrologic Conditions

5.3.1 Ground Water Hydrology

The Burbank Airport is located in the southeastern part of the San Fernando Hydrologic subarea of the Los Angeles River Basin. The volume of usable stored ground water in the San Fernando Basin is estimated to be 1 million acre-feet. Regional ground water velocity is 300 ft/yr in a southeasterly direction. Ground water in the eastern San Fernando Valley Basin is generally unconfined with a depth to water table ranging 50-200 feet. (Los Angeles City, 1983) The ground water consists of a three-component aquifer/aquitard formation. The upper layer consists of a highly permeable aquifer, approximately 100 feet in thickness. This aquifer overlies a broken, nonhomogeneous layer of relatively impermeable clay and silt. Below this aquitard, another aquifer extends 500-800 feet below the surface; this lower aquifer is a source of drinking water for Los Angeles, Burbank, and several other cities. (Los Angeles City, 1986)

Ground water replenishment in the basin occurs by deep percolation of rainfall, artificial recharge through spreading basins, and subsurface inflow. In the Airport area, percolating surface waters can infiltrate directly into the uppermost aquifer due to the coarse grain size of the alluvial deposits. This area also has characteristically high soil permeabilities resulting in higher surface infiltration rates (0.30 - 0.45 inches/hour) than the infiltration rates (0 - 0.05 inches/hour) in the western parts of the ground water basin. (Los Angeles City, 1986) Therefore, due to the high infiltration rate and soil permeability, the uppermost aquifer can become polluted from surface spills of fuels or leakage of hazardous materials from underground storage tanks.

5.3.2 Existing Water Quality Data

Public water supply wells for the Cities of Burbank and Los Angeles are located less than two miles from the Airport area. (PRC Engineering, 1984) Ground water in the area is generally within the recommended limits of the United States Public Health Service Drinking Water Standards. (Upper Los Angeles River Area Watermaster, 1986) However, in 1980 when public supply wells in the San Fernando Ground Water Basin were analyzed for volatile organics, trichloroethene (TCE) and perchloroethylene (PCE) were detected at levels above State Department of Health Services recommended action levels. While other volatile organics were present in some samples, most were detected at concentrations below State action levels. (Los Angeles City, 1983) In 1984, the U.S. Environmental Protection Agency (EPA) proposed that this well field be included on the National Priorities List for uncontrolled hazardous waste sites. This area is now eligible for federal (Superfund) assistance under the Comprehensive Environmental Response, Compensation, and Liability Act. (Los Angeles City, 1986)

The ground water in the North Hollywood area, to the west of Burbank Airport, is the most heavily contaminated. However, the ground water downgradient of the Burbank Airport, is also contaminated with TCE and PCE. Two wells in the City of Burbank were shut down as a result of the ground water contamination. (Los Angeles City, 1983) Most of these ground water contaminants are solvents; on the other hand, the underground storage tanks at the Burbank Airport contain mostly petroleum hydrocarbons. Therefore, the underground storage tanks investigated in this study would not be a likely source of these contaminants.

The contaminant concentrations vary widely in water samples taken at different times and a single point source for the contamination has not been discovered. (Los Angeles City, 1983) Tests conducted with an inflatable well packer indicate that contamination is much greater in the upper aquifer than in the lower one. Modeling studies suggest that pumping has caused contaminants to migrate from the upper contaminated aquifer to the relatively uncontaminated lower aquifer. Current cleanup projects include a proposal for the construction of an aeration facility with a granular activated carbon adsorption design to treat the contaminated water. (Los Angeles City, 1986)

5.4 Air Monitoring Results

At two locations during the drilling operations of Phase I, a reading above background level was indicated by the gas monitor. These occurred at the Hertz Equipment Rental Yard (now lease #3, formerly the old maintenance yard), at both borings done at this site. The off-gassing measured in the boring taken to 25' correlated with slight contamination detected in the laboratory results. The second gas monitor measurement in the boring to 15' does not correlate with any detectable level of contamination according to the analytical results.

5.5 Laboratory Test Results and Interpretation of Data

Most of the results from the analytical tests of Phase I were below the detection limit. Low levels of toluene (below one part per million, mg/kg) were found in three samples (1-1-A, 0.2 mg/kg and 1-2-A, 0.4 mg/kg at the Firepit; and 2-1-E, 0.6 mg/kg at the Hertz Equipment Rental Yard). The levels of toluene observed in these soil samples are close to the limit of detection for the analytical procedure used (0.1 ppm). Since the soil toluene levels are so close to the detection limit, the samples do not show much evidence of leakage.

In addition to the toluene data discussed above, low levels of other volatile organics were detected in some of the soil samples. However, since the same compounds were detected in blank samples, analyzed at the same time as part of the laboratory QA/QC procedures, these values are probably due to the storage and handling procedures in the laboratory.

A sump sample was collected from the southernmost abandoned underground storage tank at the Hertz Equipment Rental Yard (lease #3, formerly the Authority's old maintenance yard. Analysis showed this residue to be 100% petroleum hydrocarbons. Its characteristics most closely matched those of gasoline.

Samples taken during the closure of the abandoned tanks showed very low levels of contamination under three of the tanks, none was detected under the remaining three. Table 5-1 presents the Phase II analytical results.

TABLE 5-1: ANALYTICAL RESULTS FOR SOILS SAMPLED DURING CLOSURE

EPA Method 418.1

Sample Location	Sample No.	Concentration, mg/kg
Hertz Rental Yard	1	ND
	2	ND
	3	100.
Runway	4	18.
Ajax	5	12.
Hertz Return Lot	6	ND
Parking Lot	7	1.

The detection limit for the procedure is 1.0 mg/kg.

Complete Laboratory results and chain of custody forms for the Phase I investigation were included in the final report for that work. Those for the Phase II closure are included in Appendix B.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

The underground tanks considered during this study were either in various stages of use ("in use"), or were abandoned in place ("abandoned"). Several tanks listed in various background documents have been removed from the premises, and these were indicated as "removed" on the inventory. Some of the abandoned tanks have been abandoned empty, while others were left in place and slurry filled. Many of the tanks had been abandoned prior to the cutoff date for Federal tank regulations (January 1, 1974). Tanks which were not slurried upon abandonment prior to January 1, 1984, have now been abandoned in accordance with County-approved closure plans. In addition, tanks which are currently in use are subject to regulation by California Water Resources Control Board.

6.2 Tenant Owned Tanks

During the investigation, tanks and tank farms owned and operated by tenants were visually inspected. All the tenants have or are in the process of filling the proper registration forms with the County and implementing an annual program to test the integrity of the tanks at the time the Phase I investigation was conducted.

6.3 Airport Authority

The same basic requirements for a monitoring program for the tenant organizations apply for the in-use tanks maintained by the authority. This includes annual testing for tank integrity, installation of a leak detection system and/or vapor probe monitoring system, and written procedures for inspecting the tanks. In addition, the Authority should register any tank capable of being used i.e., any tank in place which is not slurry filled, with the California Water Resources Control Board. County permits should also be obtained for each tank.

Where tanks need to be replaced, it is recommended that the replacement vessels be of double-walled construction, or other approved method.

Where possible, the use of tank farms rather than many individual tanks over a widespread area is recommended. This simplifies maintenance, monitoring, and tracking procedures. It also limits the potential impact of failure of any containment system. In addition, it should reduce the overall cost of installation.

6.4 Abandoned Tanks

Tank removal plans and specifications described procedures for tank abandonment which will meet regulatory requirements. All of the abandoned tanks were removed with the exception of the tank located adjacent to Hangar 3.

As soil sampling performed at this site showed no contamination and the field investigation showed no evidence of remaining residue and removal of the tank could damage the foundations of Hangar 3, it was recommended that the tank be abandoned in place. A letter was prepared for the Burbank Fire Department detailing the reasons for the request to abandon the tank in place. The letter included an evaluation by a California-registered civil engineer.

The tank is currently being inspected for evidence of any residual material, and will be inerted and filled with slurry grout for abandonment.

Some general abandonment procedures followed for the other tanks are summarized below. The closure plans and specifications detailed the work which was required.

- In excavating the tanks, the contractor noted that the location of the tank may be approximate due to limitations on available records, precision of remote sensing technology, and other factors. The fill pipes and/or access manways were exposed prior to full-scale excavation operations.

- Where liquids remained in the tanks, these contents were pumped out, containerized, properly labeled, and removed to a suitable disposal facility. Triple rinsing and inerting of the tanks was performed in accordance with City regulations.

- The empty tanks were removed and a sample of underlying soil from one foot below the center of each tank was removed and analyzed to confirm the analytical results of this study. No contaminated soil was encountered, but if any had been, it would have been removed and disposed of as determined by the nature and level of contamination. In addition, the empty tank was properly disposed of. The tank excavation was properly backfilled, compacted, and repaved.

The tanks in the Hertz Equipment Rental Yard were removed first since a slight amount of petroleum hydrocarbons occurred in one soil sample in the investigative phase; a positive measurement was seen on the air monitor and one tank still contained liquids which were analyzed to be 100% petroleum hydrocarbons with the characteristics of gasoline. None of the other soil samples -- from the other abandoned tanks -- had displayed any compounds above the detection limit. The remainder of the tanks were removed following the work in this area. The abandonment procedures followed those requirements listed above as recommendations.

A copy of the letter recommending abandonment in place for the tank found beside Hangar 3 is attached in Appendix C.

REFERENCES

Biehler, S., 1986. Personal communication on December 5, 1986. (Professor of Geophysics from the University of California-Riverside)

Breiner, S., 1973. Applications manual for portable magnetometers. GeoMetrics, Sunnyvale, California.

CAC, Title 23, Chapter 3, Subchapter 16, August, 1985. Underground tank regulations. California State Water Resources Control Board.

City of Los Angeles, 1986. Operable unit feasibility study for the North Hollywood well field area of the North Hollywood-Burbank NPL site, San Fernando Valley Groundwater Basin. Department of Water & Power.

City of Los Angeles, 1983. Ground water management plan: San Fernando Valley Basin. Department of Water & Power.

40 CFR Part 280, May 28, 1985. Environmental Protection Agency proposed rules on notification requirements for owners of underground storage tanks.

40 CFR Parts 260, 262, 264, 265, and 270, June 26, 1985. Environmental Protection Agency proposed rules on hazardous waste management and standards for hazardous waste storage and tank treatment systems.

County of Los Angeles, 1984. Underground storage of hazardous materials: guidelines. Department of County Engineer-Facilities, Sanitation District.

Environmental Protection Agency, 1982. Test methods for evaluating solid waste, Second edition, SW-846.

Environmental Protection Agency, 1985. Regulation of underground storage tanks, RCRA subtitle I, development plan (draft).

Kris, P. L., 1982. Introduction to organic laboratory techniques. Second Edition.

Lippmann, M. and Schlesinger, R. B., 1979. Chemical contamination in the human environment. Oxford University Press, New York.

PRC Engineering, 1984. Burbank-Glendale-Pasadena Airport Final environmental impact statement/final environmental impact report for: replacement passenger terminal. Prepared for: U.S. Department of Transportation, Federal Aviation Administration, Western-Pacific Region, Lawndale, California and Burbank-Glendale-Pasadena Airport Authority, Burbank, California.

Sax, N. I., 1984. Dangerous properties of industrial chemicals. Sixth Edition. Van Nostrand Reinhold Company, New York.

Upper Los Angeles River Area Watermaster, 1986. Watermaster service in the Upper Los Angeles River area, Los Angeles County: October 1, 1984 - September 30, 1985.

Verschueren, K., 1983. Handbook of environmental data on organic chemicals. Second Edition. Van Nostrand Reinhold Company, New York.

APPENDIX A

CHEMICAL ANALYSES RESULTS AS RECEIVED FROM THE LABORATORY

Chemical Research Laboratories, Inc.
SOUTHERN CALIFORNIA DIVISION
7440 Lincoln Way • Garden Grove, CA 92641
(714)898-6370 • FAX: (714)891-5917 • (800)LAB-1CRL

April 14, 1988

A.L. BURKE ENGINEERS, INC.
1162 North Kraemer Place
Anaheim, CA 92806
ATTN: Anne Burke

ANALYSIS NO.: 809937-001/014
ANALYSES: EPA Method 418.1
DATE SAMPLED: 04/08/88
DATE SAMPLE REC'D: 04/08/88
PROJECT: Burbank

Enclosed with this letter is the report on the chemical and physical analyses on the samples from ANALYSIS NO: 809937-001/014 shown above.

The samples were received by CRL in a chilled state, intact, and with the chain-of-custody record attached.

Verbals were given April 12, 1988 at 12:50 p.m. to Ms. Marol Robinson.

Please note that ND( ) means not detected at the detection limit expressed within the parentheses.

REVIEWED AND APPROVED

Chemical Research Laboratories, Inc.
SOUTHERN CALIFORNIA DIVISION
7440 Lincoln Way • Garden Grove, CA 92641
(714)898-6370 • FAX: (714)891-5917 • (800)LAB-1CRL

LABORATORY REPORT

A.L. BURKE ENGINEERS, INC.
1162 North Kraemer Place
Anaheim, CA 92806
ATTN: Anne Burke

ANALYSIS NO.: 809937-001/014
ANALYSES: EPA Method 418.1
DATE SAMPLED: 04/08/88
DATE SAMPLE REC'D: 04/08/88
DATE ANALYZED: 04/12/88
SAMPLE TYPE: Solid
PROJECT: Burbank

SAMPLE IDENTIFICATION	TOTAL RECOVERABLE PETROLEUM HYDROCARBONS EPA METHOD 418.1 (mg/kg)
1 Hertz EQ Rental	ND(1.)
2 Hertz EQ Rental	ND(1.)
3 Hertz EQ Rental	100.
4 Runway	18.
5 Ajax	12.
6 Hertz Return	ND(1.)
7 Parking Lot	1.

APPENDIX B

CHAIN-OF-CUSTODY FORMS FOR CLOSURE SAMPLES

A. L. BURKE ENGINEERS, INC.

1162 N. KRAEMER PL., ANAHEIM, CA 92806 (714)666-1120

CHAIN OF CUSTODY FORM

SHEET 1 OF 2

PROJECT NO.	PROJECT NAME	SAMPLERS (SIGNATURES)
	BURBANK	

SAMPLING METHOD

FIELD CONDITIONS

DATE	~~TIME~~ SAMPLE #	STATION NUMBER / LOCATION	SAMPLE TYPE	SAMPLE CONTAINER	TYPE OF PRESERVATIVE	ANALYSIS REQUIRED
4-8	1A	NEAR EQ RUN	Soil	JAR	Blind	8015
	1					
	2					
	2A					
	3					
	3A					
	4	RUN WELL				
	4A	" "				
	5	AVE				
	5A	" "				
	6	NEAR EQ RUN				
	6A	" "				

COMMENTS

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
	4/8/88	4:15pm	Ron Burke				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)

BGPAA 0700

A. L. BURKE ENGINEERS, INC.

1162 N. KRAEMER PL., ANAHEIM, CA 92806 (714)666-1120

CHAIN OF CUSTODY FORM

SHEET 2 OF 2

PROJECT NO.	PROJECT NAME	SAMPLERS (SIGNATURES)
	Burke	

SAMPLING METHOD	FIELD CONDITIONS

DATE	TIME	STATION NUMBER / LOCATION	SAMPLE TYPE	SAMPLE CONTAINER	TYPE OF PRESERVATIVE	ANALYSIS REQUIRED
4/6	[illegible]					
	M	Parking Lot	Soil	Jar	Ice	8015
	M	" "	"	"	"	" "

COMMENTS

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
[signature]	4/6	4:15 p	[signature]				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)

BGPAA 0701

APPENDIX C

LETTER CONCERNING ABANDONNED TANK

AT HANGAR 3

A. L. BURKE ENGINEERS, INC.

February 16, 1987

Burbank-Glendale-Pasadena Airport Authority
2627 Hollywood Way
Burbank, CA 91505

Attn: Mr. Jan Garpner
Airport Engineer

Subject: Underground Tank Investigation Project
Recommendations for Underground Tank Adjacent to Hangar 3

References: (Drawing S-1 of Work Order No. 623 dated 5-8-41; Report Underground Tank Study by A. L. Burke Engineers, Inc., dated 18 December 1986)

Gentlemen:

After completing the investigation described in the project report, we have recommended removal of the abandoned underground tanks at the airport, with one exception. That exception is the tank located adjacent to Hangar 3. Based on available information (foundation detail drawing referenced above; known location of existing fill pipe; results of survey with Geonics Electromagnetic Induction Unit EM31), the wall of the tank is closer than ten (10) feet to the foundation of Hangar 3.

Removal of the tank would require an excavation pit with a slope of 1:1.5 due to the properties of the surrounding fill. With the tank in its identified position, this excavation would expose the foundation and cause added stresses in the soil leading to possible instability and undermining of the foundation. The foundation was not designed to withstand the forces which would be caused by excavating so close to it, and damage could occur. The attached sketch (Figure 6: Impact of Excavation at Hangar 3 from the above-referenced report) illustrates the impact of excavation on the foundation of the Hangar.

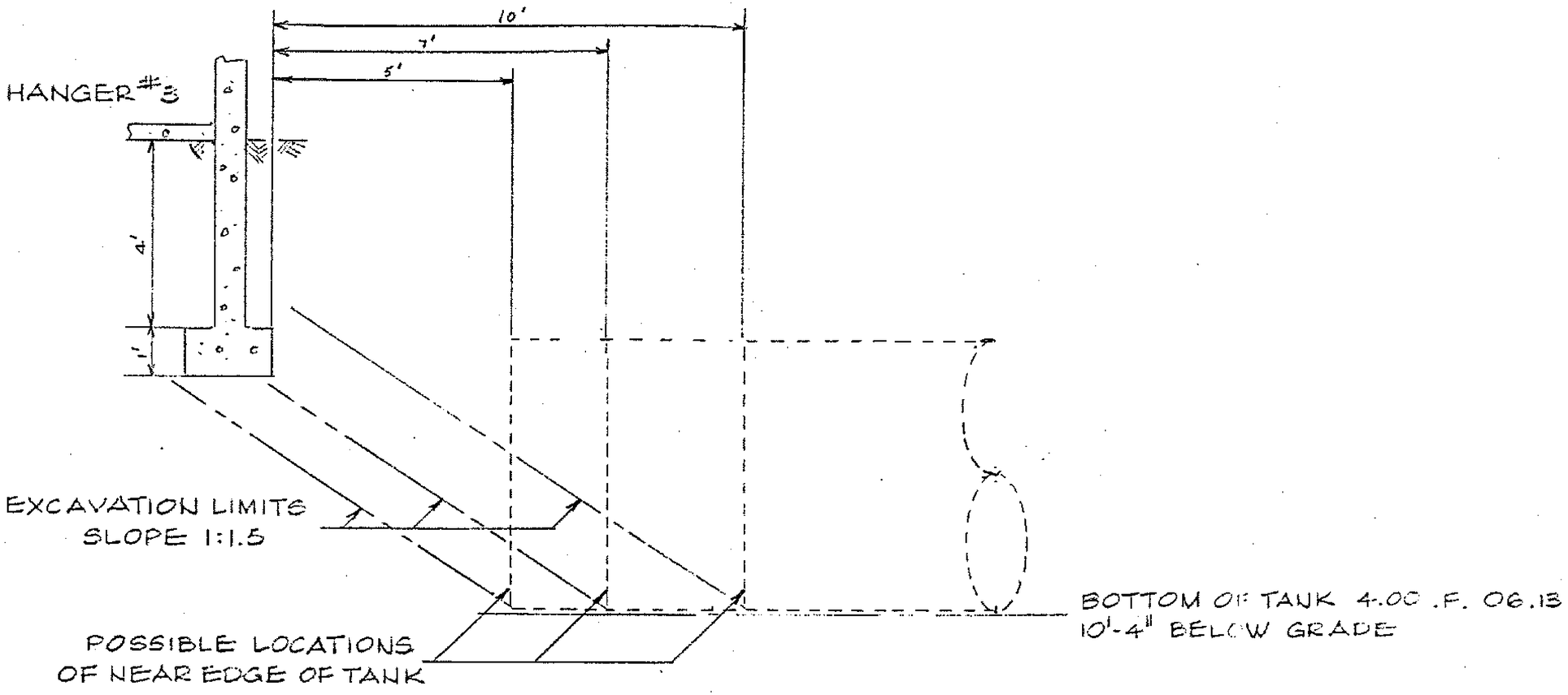
Further, the soil sampling performed at this site showed no evidence of contamination, and our inspection did not indicate any residue remaining in the tank. It is therefore recommended that the tank be abandoned in place. The absence of residue should be confirmed, and the tank should be filled with grout.

If you have any questions or need additional information, please contact Anne Burke or me.

Sincerely,

Mollie E. Halewijn, P. E.
Senior Civil Engineer

Attachment



DESCRIPTION	LE	PE	CLIENT	REV	DESCRIPTION	LE	PE	CLIENT	DRAWING NO	TITLE
1 - REPORT	RFB									

A. L. BURKE ENGINEERS, INC.
1162 NORTH KRAEMER PLACE
ANAHEIM CALIFORNIA 92806

DRAWN	CHECKED	IMPACT OF EXCAVATION AT HANGER #3
RFB DATE 2/21/87 APPR ALBE	DATE APPR CLIENT	
SCALE 3/8"=1'-0"	CLIENT DWG NO	ALBE DWG NO FIG. 6 — REV NO

BGPAA 0706